
Acromioclavicular Joint Arthritis in Persons With Spinal Cord Injury Compared to Able-Bodied Persons

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Shoulder pain is a frequently reported problem in persons with spinal cord injury (SCI), with a prevalence varying between 30% and 70%.¹⁻⁶ Commonly encountered pathogenesis include subacromial impingement,^{7,8} bursitis, tendinopathy, and rotator cuff disorders, including full or partial thickness tears.^{9,10} In the able-bodied population, arthrosis and osteoarthritis of the acromioclavicular (AC) joint have been described as a common source of shoulder pain that is often not recognized by clinicians and researchers.¹¹ Further, degenerative changes of the AC joint are only scarcely described in persons with SCI and included only persons with paraplegia.^{9,12}

The aim of the present study was to investigate the prevalence, severity, and risk of AC joint arthritis in person with SCI, presenting with shoulder pain, compared to an able-bodied population presenting with shoulder pain.

Materials and Methods

Study design

The present study is a retrospective analysis of medical records and magnetic resonance imaging (MRI). A random sample of persons with SCI and able-bodied persons, both presenting with shoulder pain, was assessed at the outpatient orthopedics clinic of the Swiss Paraplegic Center between 2007 and 2009. The study was approved by the ethical committee of the canton Luzern, Switzerland, and is in accordance with the Declaration of Helsinki.

Subjects

A person was included in the study if he or she was 18 years or older and had a current presence of shoulder pain. Persons with SCI had to be wheelchair dependent. An exclusion criterion for the study was medical indication of any bone disease (eg, rheumatoid arthritis).

Subject characteristics

From the medical records, we retrieved date of birth and gender for all subjects. In subjects with SCI, the time since injury, the level of SCI (paraplegia vs tetraplegia), and the completeness of SCI according to the International Standards for Neurological and Functional Classification of Spinal Cord Injury¹³ were also assessed from the records.

Magnetic resonance imaging

All subjects underwent MRI following a standardized protocol as part of their medical checkup. All imaging was performed on a 3T MRT unit (Philips, Amsterdam, The Netherlands) with a shoulder coil and acquired with proton density weighted (PDW), PDW inversion recovery (SPAIR), T1 weighted and T1 weighted inversion recovery (SPIR) sequences after intra-articular

Table 1. Descriptive statistics of the study population

	SCI group	Able-bodied group	P value
Number of persons	68	105	
Age, years (range)	51 (21-79)	53 (18-80)	.40
Male (%)	53 (78%)	69 (66%)	.085
Level of injury		NA	NA
Paraplegia (%)	49 (72%)		
Tetraplegia (%)	19 (28%)		
AIS score		NA	NA
A	54 (80%)		
B	6 (9%)		
C	5 (7%)		
D	2 (3%)		
Unknown (missing)	1 (1%)		
Time since injury (years, range)	23 (0-48)	NA	NA

Note: SCI = spinal cord injury, AIS = ASIA Impairment Scale. NA = not applicable.

contrast application. AC joint arthritis severity and presence of bone edema were classified according to the classification of Shubin Stein¹⁴ (grade 1, no arthrosis; grade 2, mild arthritis; grade 3, moderate arthritis; grade 4, severe arthritis).

All MRIs were assessed by 1 radiologist. A random sample of 10% of all MRIs was blinded and reassessed to calculate intrarater reliability.

Statistical methods

We used basic statistics to describe baseline demographic characteristics as well as incidence and degree of AC joint arthritis in persons with SCI and able-bodied persons. Ordered logistic regression was used to evaluate adjusted odds ratios for more severe arthritis (stepwise progressive from grade 1 to grade 4) in a multivariable model, which included study group (SCI vs able-bodied), age, and sex as predictor variables. The likelihood ratio test (LRT) was used to estimate the significance of effects. α -Error was set at 0.05, and all reported *P* values are 2-sided. Stata 11.2 software (Stata Corp LP, College Station, Texas, USA) was used to compute statistics.

Results

Subject characteristics

We included 68 persons with SCI and 105 able-bodied persons in the study. **Table 1** shows an overview of the baseline characteristics of the

subjects. The SCI and able-bodied groups showed similar distribution in age and sex. Within the SCI group, level of injury was paraplegia and tetraplegia in 72% and 28%, respectively. The predominant ASIA Impairment Scale (AIS) score (80%) was A (= complete). The mean time since injury was 23 years and not related to lesion level (*P* = .27).

Prevalence and risk factor analysis

In subjects with SCI, an overall prevalence of AC joint arthritis of 98% was found. In 18% (*n*=12), the arthritis was classified mild; in 35% (*n*=24), moderate; and in 46% (*n*=31), severe. In the able-bodied group, prevalence of AC joint arthritis was 92%. In 25% (*n*=26), the arthritis was classified mild; in 47% (*n*=49), moderate; and in 21% (*n*=22) severe. Bone edema was present in 13% (*n*=9) in the SCI group and in 22% (*n*=23) in the able-bodied group.

Cronbach α , as measure of intra-rater reliability, was 0.95 for prevalence and severity of AC joint arthritis and 0.77 for presence of bone edema.

The multivariable ordered logistic regression showed that the odds of increasingly severe arthritis, holding all other variables constant, were nearly 4 times higher in persons with SCI as compared to able-bodied persons (adjusted odds ratio [aOR], 3.97; 95% CI, 2.11-7.49; *P* < .0001); about 73% lower in females as compared to males (aOR, 0.27; 95% CI, 0.14-0.53; *P* = .0001); and

10% higher per additional year of age (aOR, 1.10; 95% CI, 1.07-1.13; $P < .0001$).

Discussion

The present comparative study, of persons presenting with shoulder pain in an outpatient orthopedics clinic, shows a higher prevalence and degree of AC joint arthritis in persons with SCI as compared to able-bodied persons. Controlling for variation in age and sex, the odds of having an increasingly severe arthritis for persons with SCI was found to be nearly 4 times higher.

The current study shows a higher prevalence of AC joint arthritis than found in former studies assessing this topic. This difference in prevalence is likely related to specific study characteristics. Boninger et al¹² found an overall prevalence of 30% in a population that included only persons with paraplegia, who were of younger age, and had a shorter time since injury (ie, 11.5 years) as compared to our population. Furthermore, their study population included both persons with (32%) and without shoulder pain. Akbar et al found a prevalence of AC joint arthritis of 42% in persons with SCI and 26% in able-bodied persons.⁹ This study also included only persons with paraplegia with a prevalence of shoulder pain of 67%. Similar to our study, Akbar et al found a higher prevalence of shoulder pathology in person with SCI when controlling for age. This effect might be caused by the high burden on the shoulder that is associated with wheelchair driving, overhead reaching, and transferring.

Relevance for clinic

The results of our study indicate that persons with SCI tend to present and are diagnosed with an advanced stage of AC joint arthritis as compared to able-bodied persons with shoulder pain. Routine assessment during yearly check-ups, which includes assessment of shoulder pain, physical examination, and diagnostic imaging (X-ray and when necessary MRI), might help to diagnose AC joint arthritis at an earlier stage. Earlier diagnosis is a prerequisite for successful conservative interventions that are aimed at preventing shoulder deterioration.

Study limitations

The current study was performed retrospectively. Patients visited the outpatient clinic with clinical significant shoulder pain. Shoulder pain was not assessed in this study with a validated measurement instrument. Furthermore, although the Swiss Paraplegic Center serves as an outpatient clinic for shoulder problems in able-bodied persons, our able-bodied group may not reflect a representative sample of the able-bodied population with shoulder pain.

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